MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

TCI3121 – COMPUTATIONAL INTELLIGENCE

(All Sections/Groups)

22 OCTOBER 2016
02:30PM – 04:30PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 3 pages (including cover page) with 4 structured questions.
2. Answer ALL questions. The distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

Question 1

(a) Briefly describe the computational intelligence components: *Artificial Neural Network*, *Fuzzy Systems* and *Evolutionary Computation*. State its origins in biological systems. (3 marks)

(b) Differentiate and illustrate the *under-training* and *over-training* in the training of a neural network. (6 marks)

(c) Explain why the performance of a neural network is very sensitive to the proper setting of the *learning rate*. (1 mark)

Question 2

(a) Briefly describes the TWO types of *uncertainties* based on the question *"How good is the weather tomorrow?"*. (4 marks)

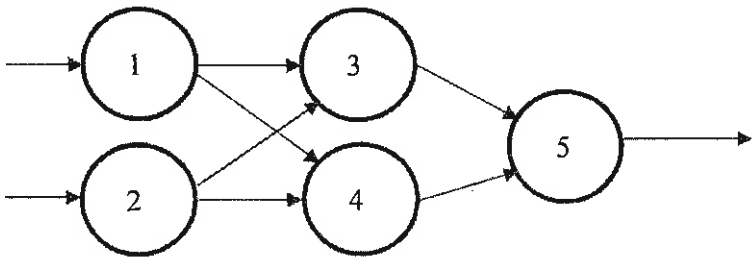
(b) Briefly explain *fuzzification* and *defuzzification*. (4 marks)

(c) Explain *crossover* and *mutation* as the operators of Genetic Algorithm. (2 marks)

Continued.....

Question 3

The architecture of the Backpropagation Neural Network is shown as below.



Assume that the neurons are using *Sigmoid* activation function, the target output is equal to 0.8, and learning rate is set to 1. The weight of the neural network $[w_{13}\ w_{14}\ w_{23}\ w_{24}\ w_{35}\ w_{45}]$ is set to [0.2 0.3 0.3 0.2 0.4 0.5]. Given an input vector [0.3 0.6], compute the following:

(a) Perform a forward pass on the network. (3 marks)
(b) Compute the error occurred at neuron 5. (1 mark)
(c) Perform a backward pass on the network. (6 marks)

Question 4

(a) Using your own intuition and definition of the universe of discourse, list out the linguistic variables of the fuzzy membership function for *"height of people"*.

(2 marks)

(b) Construct the linguistic variable in (a) using triangular membership function.

(2 marks)

(c) Consider $R_1 \in X \times Y = \begin{bmatrix} 1 & 0.5 & 0.6 \\ 0.4 & 0 & 0.8 \\ 0.3 & 0.7 & 0.9 \end{bmatrix}$ and $R_2 \in Y \times Z = \begin{bmatrix} 0.2 & 0.6 \\ 1 & 0.5 \\ 0.1 & 0.7 \end{bmatrix}$.
Compute the Max-Min composition of $R_1 \circ R_2$.

(6 marks)

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